

WHAT IS CLAIMED IS:

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1. A semiconductor device comprising:
a single-crystal silicon substrate; and
a single-crystal oxide thin film having a
perovskite structure formed through epitaxial growth
10 on the single-crystal silicon substrate, said
single-crystal oxide thin film being directly in
contact with a surface of the single-crystal silicon
substrate, and containing a bivalent metal that is
reactive to silicon.

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2. The semiconductor device as claimed in
20 claim 1, wherein the bivalent metal is any bivalent
metal but Sr.

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3. The semiconductor device as claimed in
claim 1, wherein the single-crystal oxide thin film
is selected from the group consisting of PbTiO_3 ,
 PbZrO_3 , $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$, $(\text{Pb}, \text{La})(\text{Zr}, \text{Ti})\text{O}_3$, BaTiO_3 , and
30 $(\text{Ba}, \text{Sr})\text{TiO}_3$.

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4. A semiconductor device comprising:
a single-crystal silicon substrate;
a single-crystal oxide thin film having a

perovskite structure formed through epitaxial growth
on the single-crystal silicon substrate; and
an amorphous silicon layer interposed
between the single-crystal silicon substrate and the
5 single-crystal oxide thin film.

10 5. A semiconductor device comprising:
a single-crystal silicon substrate;
a first single-crystal oxide thin film
having a sodium chloride structure formed through
epitaxial growth on the single-crystal silicon
15 substrate; and
a second single-crystal oxide thin film
having a perovskite structure formed through
epitaxial growth on the first single-crystal oxide
thin film,
20 said first single-crystal oxide thin film
being selected from the group consisting of CaO, SrO,
and BaO.

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6. The semiconductor device as claimed in
claim 4, wherein the single-crystal oxide thin film
contains a bivalent metal selected from the group
30 consisting of Sr, Ba, Pb, and La.

35 7. The semiconductor device as claimed in
claim 4, wherein the single-crystal oxide thin film
is selected from the group consisting of PbTiO_3 ,

PbZrO_3 , $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$, $(\text{Pb}, \text{La})(\text{Zr}, \text{Ti})\text{O}_3$, BaTiO_3 , $(\text{Ba}, \text{Sr})\text{TiO}_3$, and SrTiO_3 .

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8. A semiconductor device comprising:
a single-crystal silicon substrate;
a first single-crystal oxide thin film
10 having a sodium chloride structure formed through
epitaxial growth on the single-crystal silicon
substrate;
a second single-crystal oxide thin film
having a perovskite structure formed through
15 epitaxial growth on the first single-crystal oxide
thin film; and
an amorphous layer formed between the
single-crystal silicon substrate and the first
single-crystal oxide thin film.

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9. The semiconductor device as claimed
25 in claim 8, wherein the first single-crystal oxide
thin film is selected from the group consisting of
 MgO , CaO , SrO , and BaO .

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10. The semiconductor device as claimed
in claim 8, wherein the second single-crystal oxide
thin film is selected from the group consisting of
35 PbTiO_3 , PbZrO_3 , $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$, $(\text{Pb}, \text{La})(\text{Zr}, \text{Ti})\text{O}_3$,
 BaTiO_3 , $(\text{Ba}, \text{Sr})\text{TiO}_3$, and SrTiO_3 .

11. A method of forming an epitaxial film, comprising the steps of:

5 forming a plume by irradiating a target containing a bivalent metal carbonate with a laser beam;

developing a bivalent metal oxide film from the bivalent metal carbonate through epitaxial growth on a single-crystal silicon substrate set in a passage of the plume; and

10 heating a surface of the target with an independent heat source different from the laser beam, thereby producing a single-crystal oxide epitaxial film.

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12. The method as claimed in claim 11, wherein the step of heating the surface of the target is performed at the same time as the irradiation with the laser beam.

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13. The method as claimed in claim 11, further comprising the step of heating the plume.

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14. The method as claimed in claim 11, wherein the step of heating the surface of the target is performed prior to the irradiation with the laser beam.

15. The method as claimed in claim 11,
wherein the step of heating the surface of the
target is performed at such a temperature that the
carbonate decomposes on the surface of the target.

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16. The method as claimed in claim 11,
further comprising the step of forming an oxide film
having a perovskite structure through epitaxial
growth on the single-crystal oxide epitaxial film by
irradiating another target with a laser beam.

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17. A laser ablation device comprising:
a processing chamber that is exhausted by
an exhausting system;

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a processed substrate that is held within
the processing chamber;

a target that is provided in the
processing chamber and faces the processed
substrate;

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an optical window that is provided in the
processing chamber and corresponds to an optical
path of the laser beam irradiating the target; and

a heat source that is provided in the
processing chamber and covers a space between the
processed substrate and the target.

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